Australian Bureau of Statistics

1350.0 - Australian Economic Indicators, 1996

ARCHIVED ISSUE Released at 11:30 AM (CANBERRA TIME) 13/02/1996

1996 Feature Article - Sense and Sensitivity

This article was published in Australian Economic Indicators January 1996 issue on 9 January 1996.

Introduction

The ABS publishes trend estimates for a large number of its time series. These trend estimates provide useful information about the underlying movements in a time series, which can be harder to ascertain from the original or seasonally adjusted data. A qualification attached to the use of trend data is that the last few estimates are subject to revision. As data for subsequent time periods become available, these are included in the trend estimation procedure, usually resulting in revisions to recent trend estimates. It is the likelihood of future revisions that gives rise to the use of ‘sensitivity analysis’.

Since 1989, the ABS has included sensitivity analysis in a number of its publications. This analysis (also called ‘what if..?’ analysis) shows how the trend path of a time series would be affected by various hypothetical outcomes in the next month or quarter. The extract below, taken from the September 1995 edition of Building Approvals (cat. no. 8731.0), shows a typical format for the presentation of sensitivity analysis in ABS publications.

This article begins with a brief explanation of the differences between the various series published by the ABS. It then discusses the use and relevance of sensitivity analysis by looking at the method used to derive trend estimates. Building approvals data are used to give examples of the practical application of sensitivity analysis.

Time series

The ABS publishes three sets of estimates for many of its time series - original, seasonally adjusted and trend. As the various series reflect different aspects of the data, it is always best to consider them side-by-side, rather than in isolation.

The original series is composed of three factors - underlying trend influences, seasonal influences and short term irregular factors. Seasonal adjustment aims to remove the effect of regular seasonal influences (such as increased retail turnover prior to Christmas); normal ‘trading’, ‘working’ or ‘pay’ day patterns (for example, the effect of having three rather than two pay days in a month); and systematic holiday effects (for example, the effect of Easter falling in March rather than April).

Once these seasonal factors have been removed, the trend estimation process aims to reduce the impact of irregular movements that remain in the series. Thus, trend estimates give a clearer indication of the underlying movement of a series, as they are unaffected by the seasonal and irregular influences which account for a significant proportion of the movements in many time series.

In some cases, the original or seasonally adjusted data may be preferred, as they convey

information about ‘actual’ events which is obscured by the trend estimates. For example, the approval of the Sydney casino development in April 1995 introduced a large irregular component into the original and seasonally adjusted value of building approved, which was not reflected in the trend. However, the irregular component in the original and seasonally adjusted series does not always reflect real world phenomena, but may also reflect statistical errors, such as sampling error and measurement errors. This should be borne in mind when interpreting original or seasonally adjusted data.

GRAPH A: WHAT IF... ? REVISIONS TO TREND ESTIMATES: VALUE OF RESIDENTIAL BUILDING APPROVED

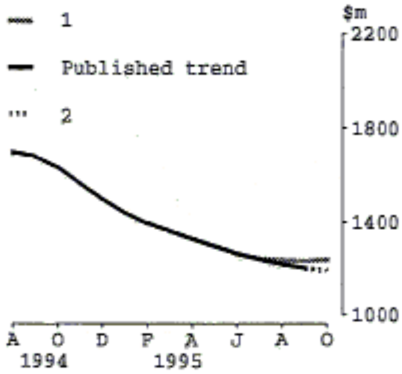


TABLE A: WHAT IF... ? REVISIONS TO TREND ESTIMATES: VALUE OF RESIDENTIAL BUILDING APPROVED

	TREND AS PUBLISHED		WHAT IF NEXT MONTH’S SEASONALLY ADJUSTED ESTIMATE:			
			1. rises by 5% on Sep 1995		2. falls by 5% on Sep 1995	
	$m	% change	$m	% change	$m	% change
1995						
May	1,296.5	-2.4	1,291.6	-2.6	1,295.5	-2.5
June	1,266.6	-2.3	1,264.2	-2.1	1,266.2	-2.3
July	1,239.6	-2.1	1,245.0	-1.5	1,239.8	-2.1
August	1,217.9	-1.8	1,235.5	-0.8	1,218.2	-1.7
September	1,203.5	-1.2	1,234.9	0.0	1,202.3	-1.3
October	. .	. .	1,240.9	0.5	1,191.8	-0.9

Source: ABS Building Approvals September 1995 (Cat. No. 8731.0)

GRAPH B: WHAT IF... ? REVISIONS TO TREND ESTIMATES: VALUE OF NON-RESIDENTIAL BUILDING APPROVED

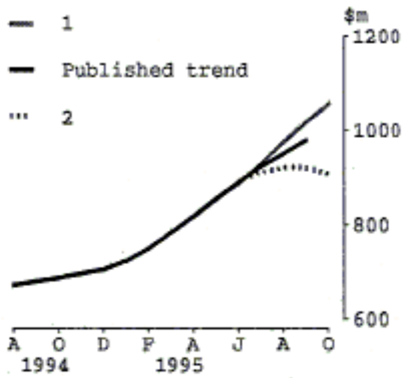


TABLE B: WHAT IF... ? REVISIONS TO TREND ESTIMATES: VALUE OF NON-RESIDENTIAL

BUILDING APPROVED

	TREND AS PUBLISHED		WHAT IF NEXT MONTH'S SEASONALLY ADJUSTED ESTIMATE:			
			1. rises by 19% on Sep 1995		2. falls by 19% on Sep 1995	
	$m	% change	$m	% change	$m	% change
1995						
May	855.9	4.5	851.5	4.3	863.5	4.9
June	889.7	3.9	887.6	4.2	893.6	3.5
July	923.1	3.8	929.5	4.7	913.7	2.2
August	951.3	3.1	974.5	4.8	922.4	1.0
September	980.3	3.0	1,017.7	4.4	919.5	-0.3
October	. .	. .	1,055.5	3.7	907.2	-1.3

Source: ABS Building Approvals September 1995 (Cat. No. 8731.0)

Use of sensitivity analysis

As mentioned earlier, the most recent trend estimates are subject to revision. In certain cases, revisions to trend data may occur when the original or seasonally adjusted data, on which the trend estimates are based, are revised. Revisions to trend estimates also result from the incorporation of a new month's or quarter's seasonally adjusted data into the trend estimation procedure. This second type of revision is the result of the method used to derive trend estimates, and it is these revisions which are addressed by sensitivity analysis. Sensitivity analysis quantifies the revisions which would occur to current trend estimates under various hypothetical situations, and in so doing gives an indication of the stability of the published estimates.

For example, consider a situation where a trend series has shown its first increase after a long period of decline i.e. a turning point is signalled. The sensitivity analysis might show that a relatively small movement in the subsequent month's seasonally adjusted value would lead the earlier trend estimates to be revised such that a turning point was no longer apparent. In this case, analysts might not attach great significance to the turning point until later data confirmed or refuted it, or might consult other information to assess whether a turning point was likely. For example, in the case of building approvals data, the analyst might look at other economic data (such as GDP growth), or consider anecdotal evidence on business conditions. On the other hand, if the sensitivity analysis made it clear that only a very large and unlikely movement in the series would bring about revisions which would invalidate the turning point, the analyst might consider the turning point with less caution. By showing how sensitive the trend estimates are to the addition of new data, the analysis provides information which can help make a better assessment of the data.

Derivation of trend estimates

In order to understand the rationale for sensitivity analysis, it is necessary to first consider the way in which trend estimates are derived. There are many procedures which can be used to smooth data series and produce trend estimates, many of which are based on calculating moving averages. For example, a smoothed series may be based on a simple 13-term moving average. This method would take 13 consecutive data observations, sum them and divide by 13, thereby giving each observation equal weight. By dropping the first value and calculating an average using the remaining twelve values plus one further data observation, a smoothed value for the subsequent period can be derived.

One major disadvantage with using simple averages is that the resulting smoothed series does not accurately reproduce turning points or points of inflexion(footnote 1), only performing well for linear series. As the majority of the time series published by the ABS are non-linear i.e. they have turning points and points of inflexion, the ABS prefers to use an alternative smoothing procedure, known as the Henderson moving average method(footnote 2). This method is specifically designed to produce smoothed series which accurately represent turning points and points of inflexion. A Henderson moving average differs from a simple moving average in that the weights are not identical for each observation. However, the weighting pattern is symmetric, which means that, for a 13-term average, the weights for the first and last observations are identical, as are those for the 2nd and 12th, the 3rd and 11th etc. The central observation (e.g. observation 7 in a 13-term average) carries the greatest weight. The ABS uses a 13-term moving average for monthly series and a 7-term moving average for quarterly series.

The ABS centres the resulting moving averages, which means that when the most recent 13 (or 7) values in a series are used, the average derived is placed in the month or quarter in the centre of the time period used for the average. So, for example, in a monthly series such as building approvals, if the latest month for which data are available is October 1995, this would mean a symmetric 13-term Henderson-weighted moving average would use data from the thirteen months spanning October 1994-October 1995. The resulting average would be placed on the 7th month of the series (i.e. the central month), in this case April 1995. The practice of centring moving averages is adopted so as to avoid ‘time phase shifting’. If the averages are not centred (for example, if the average derived from the October 1994-October 1995 data was placed on October 1995), the resulting trend series is shifted to the right, so that any turning points are misrepresented and appear to have occurred later than they actually did.

The drawback with centring moving averages is that it yields no trend estimate for the most recent time periods. As explained above, if the average based on the most recent 13 months’ data is centred, the result is placed on the 7th month, thus yielding no estimate for the most recent 6 months. Similarly, with a 7-term moving average, as is used for quarterly data, no trend estimates can be derived for the most recent 3 quarters. This problem is known as the ‘end point problem’. There are various ways to deal with this problem; the solution chosen by the ABS is to use ‘surrogate filters’ to produce trend estimates for the most recent periods. Surrogate filters have an asymmetric weighting structure and there is a different surrogate filter for each of the data points that cannot be trended by the Henderson filter. The surrogate filters are chosen so that they approximate the Henderson moving average, but differences do exist between the filtering properties of the surrogates and the symmetric Henderson. As new seasonally adjusted data become available for later periods, values at the current end of a time series are smoothed by a succession of surrogate filters until a centred Henderson moving average can be calculated. Consequently, recent trend estimates may be revised as new data become available, particularly for more volatile time series.

In most cases, the end point problem also affects the first few data points in a time series, as the Henderson moving average makes use of data values both before and after the time period in question. Since data earlier than the start of the time series is unlikely to become available, the earliest trend estimates will always be derived using the surrogate filters. However, they will not be revised unless there are revisions to the underlying original or seasonally adjusted data which affect the trend.

What if...?

Technically, all recent trend estimates which have not been calculated using the Henderson moving average method (the latest 6 monthly estimates, or latest 3 quarterly estimates) should be treated as provisional. However, in practice, only the last 3 monthly (or 2 quarterly) values tend to be subject to significant degrees of revision. Until trend estimates can be calculated using

a Henderson moving average, sensitivity analysis can help give an indication of the stability of the latest estimates and how they would be affected under various hypothetical future situations. It should be noted that sensitivity analysis quantifies only those revisions which will result from the incorporation of new data in the trend estimation procedure. If there are other revisions affecting the trend data, the outcome will be different from that shown by the sensitivity analysis.

There are two common approaches to sensitivity analysis. The first approach looks at how the trend would be revised if the seasonally adjusted series moves by a given amount. This is the most common form of sensitivity analysis seen in ABS publications, and the example shown at the beginning of this article illustrates this approach. In particular, this approach might consider what would happen if the next period's seasonally adjusted estimate rises/falls by the average absolute percentage change (AAPC) in that series. The AAPC is a simple average of the magnitude of the percentage changes i.e. the direction of the change is ignored. It should not be interpreted as measuring deviation from trend. When a series is consistently rising or falling over the period of measurement, the AAPC will indicate the average rise or fall. In other cases, it simply shows the average movement (either up or down) that has occurred over the period. Where possible, the AAPC is calculated with reference to the last ten years' data.

For example, the trend estimate for the value of residential building approved in September 1995 was $1,203.5 million, and the seasonally adjusted estimate was $1,248.4 million (a rise of 5.7 per cent on August 1995). Over the last ten years, the AAPC for the seasonally adjusted series has been approximately 5 per cent. Sensitivity analysis might therefore consider how the most recent trend estimates would be affected if next month's seasonally adjusted estimate is $1,310.8 million (5 per cent higher) or $1,186.0 million (5 per cent lower). By applying a 13-term Henderson moving average, and the surrogate filters, to the most recent 12 observations plus each of the hypothetical observations, two new sets of estimates for recent trend values can be obtained. These hypothetical trend paths can then be compared with the current estimates to assess the impact this outcome would have on the trend estimates. The extract from the ABS's Building Approvals publication at the beginning of the article shows these two scenarios.

An analyst may be interested to know how the trend path would be affected by movements in the seasonally adjusted series other than those published. For example, the analyst might have information which leads him/her to expect an above-average increase in the seasonally adjusted series in October 1995. The impact of this on the October trend estimate can be deduced from the published information using the following method.

The published analysis shows what the October 1995 trend estimates would be if the seasonally adjusted estimate rises or falls by 5 per cent in October. A rise of 5 per cent in the seasonally adjusted estimate would yield a trend estimate of $1,240.9 million; a fall of 5 per cent would result in a trend estimate of $1,191.8 million. The mid-point between these two hypothetical outcomes shows what would happen to the trend if there was no growth in the seasonally adjusted estimate in October 1995. This mid-point is given by**:**

($1,191.8m + $1,240.9 m) / 2 = $1,216.35m.

That is, if the seasonally adjusted series was unchanged in October 1995, the trend estimate for October would be $1,216.35 million. Once this 'base' value is known, the effect of any given percentage movement in the seasonally adjusted series can be deduced, as the effect on the trend value varies in direct proportion with the percentage change in the seasonally adjusted series. Five per cent growth in the seasonally adjusted series results in the trend estimate being $1,240.9m - $1,216.35m = $24.55 m higher than it would be if the seasonally adjusted estimate was unchanged. Thus, each percentage point increase (or decrease) in the seasonally adjusted series will increase (or decrease) the trend estimate by $24.55m / 5 = $4.91m from the 'base' value of $1,216.35m. Suppose an analyst had reason to expect a 10 per cent rise in the seasonally adjusted series in October 1995. He/she could expect to see an October trend

estimate of:

(10 * $4.91m) + $1,216.35m = $1,265.45m.

The same procedure can be applied to any of the other provisional trend estimates. So, by a similar process, it can be calculated that zero growth in the October 1995 seasonally adjusted estimate will lead to a revised September 1995 trend estimate of:

($1,202.3m + $1,234.9m) / 2 = $1,218.6m.

This implies that each percentage point rise/fall in the October seasonally adjusted estimate adds/subtracts (1,234.9m - 1,218.6m) / 5 = $3.26 million to/from this base value. Therefore, growth of 10 per cent in the October 1995 seasonally adjusted estimate would result in a revised September 1995 trend estimate of:

(10 * $3.26m) + $1,218.6m = $1,251.2m.

The trend growth between September and October 1995 would then be:

[($1,265.45m / $1,251.2m)-1]*100= 1.1 per cent.

The approach described above considers what would happen to the trend if there was a particular movement in the seasonally adjusted estimate. An alternative approach is to consider a particular movement in the trend estimate and assess how the seasonally adjusted series would have to move in order to give this result. The required movement in the seasonally adjusted estimate can then be compared with the AAPC and, in conjunction with other information the analyst might have, the likelihood of this outcome can be assessed. Scenarios which might be considered include assessment of the seasonally adjusted estimate that would result in:

(a) No revision to the current trend estimate when next month’s (or quarter’s) data becomes available.

(b) Maintenance of the current trend growth.

(c) Zero trend growth between the current trend value (when revised next issue) and that derived next month (or quarter).

For example, on the basis of the estimates of the value of residential building approved up to September 1995, the October 1995 seasonally adjusted figure would have to rise 1.3 per cent in order to give zero trend growth between September and October 1995 (scenario ‘c’). Any rise in excess of 1.3 per cent would reverse the downward trend. As 1.3 per cent is low relative to the observed AAPC of 5 per cent, a rise sufficient to reverse the trend would seem a possible outcome. An analyst may have additional information which would lead him/her to expect such a rise in October’s seasonally adjusted estimate, and so might attach a reasonably high probability to this outcome. On the other hand, the analyst might be expecting a fall in the seasonally adjusted estimate, and so would consider the evidence for a turning point to be weak.

An important point to remember is that this type of sensitivity analysis does not represent an attempt to forecast outcomes. It simply assesses the impact that various hypothetical outcomes in the next period would have on past trend estimates. In this way, it indicates the robustness of past trend estimates, and the reliability of turning points, but makes no statement about the likelihood of the various outcomes occurring. The assessment of likelihood must be made in the context of more detailed information on factors affecting the series, which is not incorporated in the sensitivity analysis.

Examples

The following examples are based on two monthly building approvals series: the value of residential building approvals and the value of non-residential building approvals. These series have been chosen in order to illustrate the use of sensitivity analysis for a relatively stable series (value of residential building approvals) and a highly volatile series (value of non-residential building approvals). Over the last ten years, the average size of the monthly movement in the seasonally adjusted value of residential building approvals has been approximately 5 per cent; for the value of non-residential building approvals (one of the most volatile series for which the ABS produces trend estimates) the average size of the monthly movement in the seasonally adjusted series has been approximately 19 per cent. The examples consider the current trend estimates for both series and also examine a turning point in the non-residential building approvals series.

(1) Current trend estimates of building approvals

The extract from the ABS's Building Approvals publication at the beginning of the article shows the sensitivity analysis published in September 1995 for the two series in question. In both cases, the sensitivity analysis considers what would happen to recent trend estimates if the seasonally adjusted series rises or falls by the AAPC in October 1995. For both series, one of these outcomes would indicate the possibility of a turning point.

Value of residential building approvals

The trend estimate for the value of residential building approvals has been falling consistently since August 1994. A fall in the seasonally adjusted series equivalent to the AAPC of 5 per cent in October 1995 would see this downward path continue, although the rate of decline will be slower. However, if the seasonally adjusted series rises by 5 per cent, the recent trend values will be revised such that the downward trend ceases in September, and a small rise in the trend estimate is seen in October. Over the last ten years, movements of 5 per cent or more have not been rare. Thus, an analyst would be alerted to the fact that even an upward movement in the seasonally adjusted series next month that is smaller than the AAPC could reverse the downward trend. Equally, the rate of decline will slow if the seasonally adjusted estimate falls by the AAPC, suggesting that a turning point or point of inflexion could be imminent, even if it does not become apparent next month. In this way, the sensitivity analysis has provided extra information which is not apparent from a simple examination of the published series. In conjunction with other information (statistical and/or anecdotal), the analyst could then make a more informed assessment of the situation.

Value of non-residential building approvals

Trend estimates of the value of non-residential building approvals have been rising continuously since May 1994. The sensitivity analysis shows that a rise of 19 per cent in the seasonally adjusted series would slow the rate of increase in the trend slightly. Alternatively, the revisions that would occur following a fall of 19 per cent in the seasonally adjusted series in October would reverse the trend and result in falling trend values in September and October. In this case, as the series is more volatile, the potential revisions are greater and the two distinct outcomes are much more clearly visible in the graph. Again, the published sensitivity analysis suggests the possibility of a turning point becoming apparent next month or in the near future.

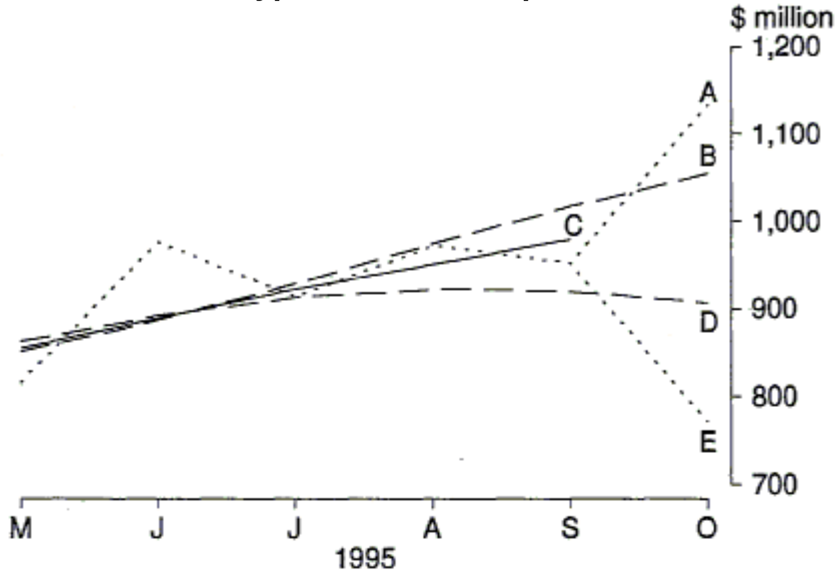
Although the two hypothetical trend paths are asymmetrical around the recent trend in this example, analysts should not conclude that the possibility of a downward revision in the trend series (once October 1995 data become available) is stronger than the possibility of an upward revision, or that a turning point is more likely than a continuation of the recent upward trend. This is not the case, and care must be taken when interpreting such graphs. The two hypothetical

trend paths can be expected to be asymmetrical about the recent trend when the trend series is showing steady growth or decline. This asymmetry has two causes:

First, the upper and lower paths are based on changes equivalent to the AAPC in the next seasonally adjusted estimate. They are therefore symmetrical around the ‘base’ scenario of zero growth in the next month’s seasonally adjusted estimate (see following graph), not around the recent trend path. When a series is rising steadily, the upper path will generally be close to the trend path. The lower path represents the effect of a seasonally adjusted figure which not only fails to continue the steady growth, but in fact shows a fall, with the result that the lower path drops away quite noticeably from the current trend path. This is the case with the value of non-residential building approvals. As can be seen from the following graph, September’s seasonally adjusted estimate was below the trend estimate for that month. This, combined with the fact that the trend has recently shown steady growth, means that the lower hypothetical trend path shows greater diversion from the recent trend than the upper hypothetical path.

Second, when a series is showing growth, the surrogate or endpoint filters used by the ABS to estimate the last few trend figures are known on average to exhibit a small downward bias; as observations are added to the series, the most recent trend estimate tends to be revised upwards by a small amount. The ABS is investigating methods for dealing with this feature of its procedures and, in particular, assessing the consequences of alternative procedures for key characteristics of time series, including endpoint bias and overall stability.

GRAPH C. NON-RESIDENTIAL BUILDING APPROVALS
Hypothetical trend paths



Source: ABS 8731.0, Monthly data

A: Seasonally adjusted up 19 per cent on September 1995

B: Upper trend path

C: Current trend path

D: Lower trend path

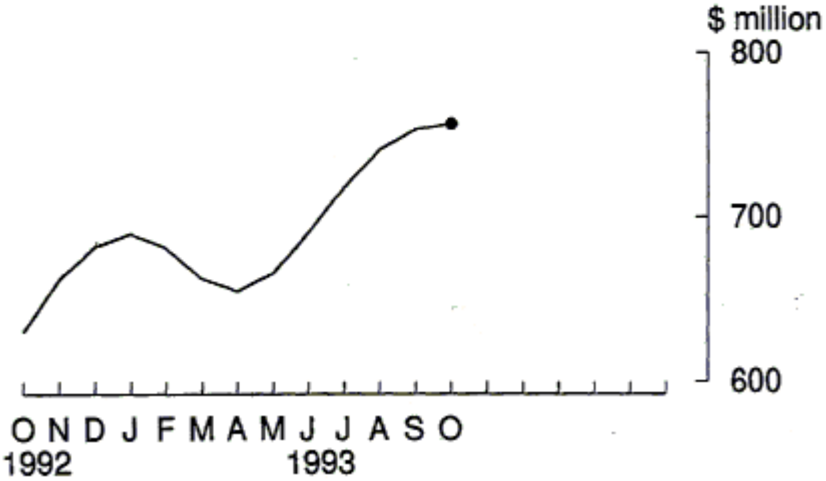
E: Seasonally adjusted down 19 per cent on September 1995

(2) Turning point in the trend value of non-residential building approvals

There was a turning point in the trend series for the value of non-residential building approvals at September 1993(footnote 3). However, turning points are not always detected immediately, and may only become evident as the trend estimates are revised in subsequent months, when new

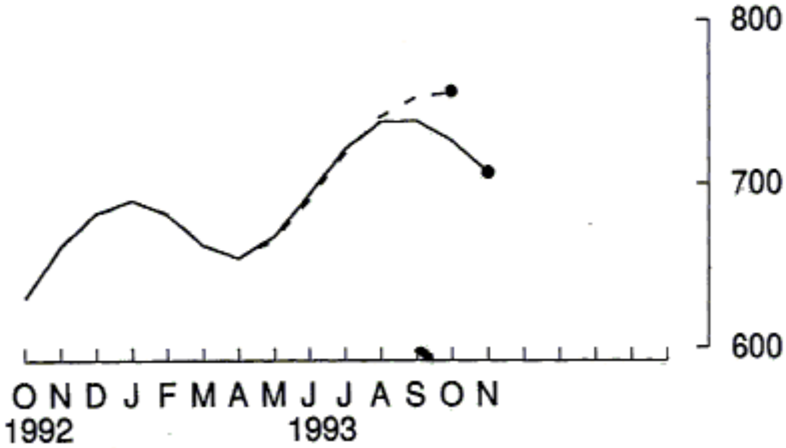
data become available and are included in the trend estimation process. The graphs and text on the following page describe the stages in the detection of the September 1993 turning point, and how it was confirmed over subsequent months, showing how the sensitivity analysis provided additional information which helped in the assessment of the data. The months referred to are the latest month for which estimates were published, not necessarily the month in which the data were released e.g. June refers to the release of June data (although this was actually published in July). In the graphs, each additional month's data is superimposed on the graph for the preceding month, so that the effect of revisions can be seen. For example, Graph 1 shows only the data published in October 1993; Graph 2 shows the data published in October 1993 and (where different) the data published in November 1993; Graph 6 shows the data published in each month from October 1993 to April 1994.

GRAPH 1. NON-RESIDENTIAL BUILDING APPROVALS, TREND
October 1993



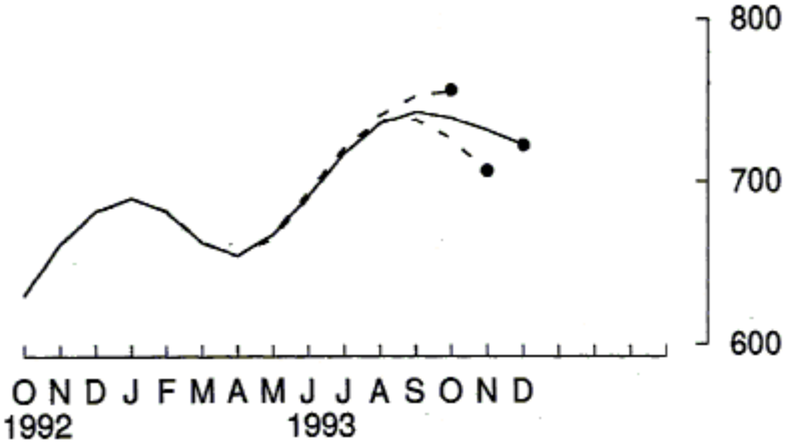
October 1993 (Graph 1): A turning point in September 1993 (as later emerged) would require there to be a fall in the series between September 1993 and October 1993. Initially this was not the case, with the first published estimate for October showing an increase of 0.5 per cent on September. However, the sensitivity analysis published in this month did suggest the possibility of a turning point. The analysis stated that it would require an increase of 47 per cent or more in the seasonally adjusted estimate for November 1993 to prevent a downward turn in the series. Although this required change was well in excess of the AAPC (18 per cent at the time) the volatile nature of the series means that a rise of 47 per cent would be considered possible (the October 1993 seasonally adjusted estimate was 45 per cent lower than the previous month). Consequently, an analyst might have been cautious about announcing a turning point at this stage.

GRAPH 2. NON-RESIDENTIAL BUILDING APPROVALS, TREND
November 1993



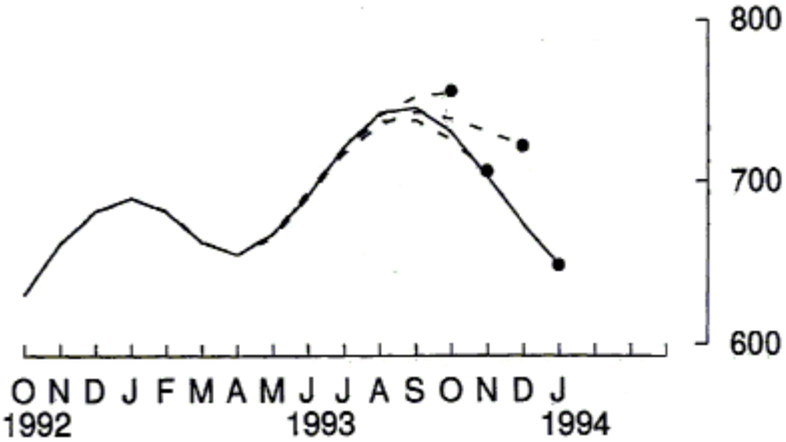
November 1993 (Graph 2): When the November 1993 estimate became available and was included in the trend estimation procedure, the May 1993-October 1993 results were revised. As can be seen from the graph, the largest revisions involved the most recent estimates (only the September and October estimates were revised by more than 1 per cent). Both the September 1993 and October 1993 trend estimates were revised downwards (by 1.9 per cent and 4 per cent respectively). This resulted in the October estimate now being 1.7 per cent lower than the September 1993 estimate, thereby giving evidence of the turning point that the previous month's sensitivity analysis had suggested as a possible outcome. The sensitivity analysis published in November showed that it would require a rise well in excess of the AAPC to result in revisions significant enough to cancel out this turning point.

GRAPH 3. NON-RESIDENTIAL BUILDING APPROVALS, TREND
December 1993



December 1993 (Graph 3): On publication of the December 1993 estimate, the October estimate was revised upwards by 1.7 per cent. As the upward revision in the September estimate was much smaller (0.5 per cent), these revisions made the turning point much weaker, with a fall of only 0.5 per cent between the revised September and October trend estimates. The sensitivity analysis also gave weaker support for a September turning point, showing that a rise equivalent to the AAPC in January would lead to revisions in the trend estimates such that a turning point would no longer be apparent.

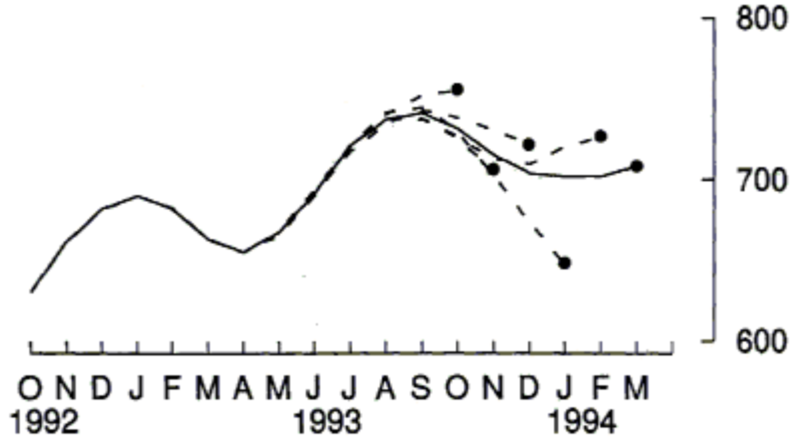
GRAPH 4 NON-RESIDENTIAL BUILDING APPROVALS, TREND
January 1994



January 1994 (Graph 4): There was a downward revision of 1.2 per cent in the October estimate when the January 1994 estimate was published. As the September estimate was revised upwards slightly at the same time, the turning point now appeared stronger, with a 2.1 per cent fall between September and October. In the same month the sensitivity analysis also gave firmer

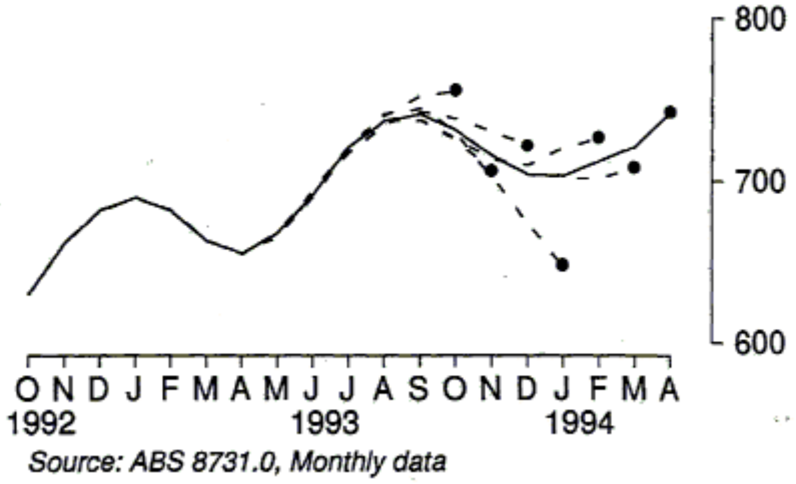
evidence for a turning point, showing that a rise in February equivalent to the AAPC (now 19 per cent) would leave the trend estimates for September and October virtually unchanged, still with a 2.1 per cent fall between September and October.

GRAPH 5. NON-RESIDENTIAL BUILDING APPROVALS, TREND
February - March 1994



February - March 1994 (Graph 5): There were further small revisions in the September and October estimates over the next two months. These were not significant enough to affect the timing of the turning point, although the percentage change between September and October did narrow to 1.6 per cent and then 1.3 per cent. The published sensitivity analysis continued to corroborate the evidence of a turning point.

GRAPH 6. NON-RESIDENTIAL BUILDING APPROVALS, TREND
April 1994



April 1994 (Graph 6): By the time the April 1994 estimate was published, there were sufficient data points to allow a 13-term Henderson moving average to be applied to both the September and October estimates, meaning that any further revisions would be entirely due to revisions in the underlying seasonally adjusted data, rather than the trend estimation procedure. The 'finalised' values for the two months showed a fall of 1.3 per cent between September and October. The final September estimate was 12 per cent lower than the first estimate, and the final October estimate was 3.2 per cent lower. However, in both cases the largest revision took place in the first month: the first September estimate was revised downwards by 10.6 per cent in the first month after publication and the initial October estimate was revised downwards by 4 per cent after the first month. After the first month, neither estimate was revised by more than 2 per cent, demonstrating how quickly the trend estimates converge towards their final value, even for a highly volatile series.

The data underlying the graphs are shown in Table 1.

TABLE 1. VALUE OF NON-RESIDENTIAL BUILDING APPROVED

TRENDS ESTIMATES, $M

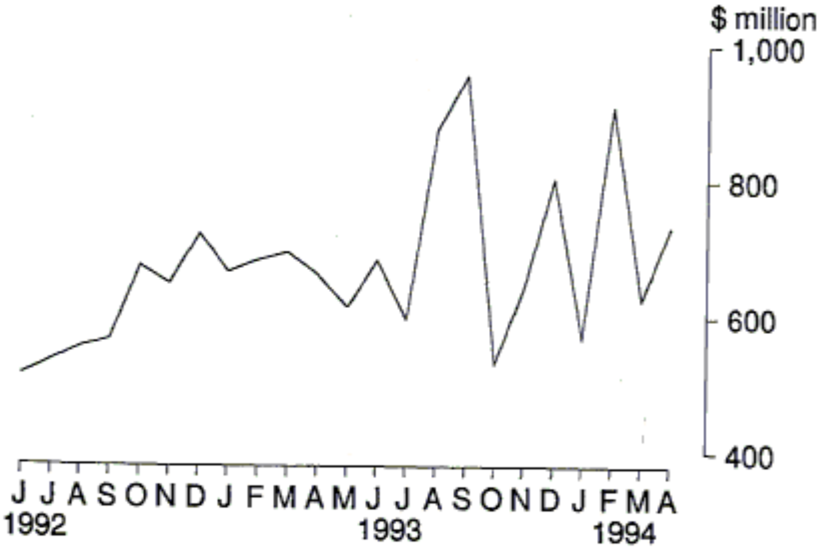
	Publication (a):						
	Oct 93	Nov 93	Dec 93	Jan 94	Feb 94	Mar 94	Apr 94
October 1992	630.8	630.8	630.8	630.8	630.8	630.8	630.8
November 1992	662.1	662.1	662.1	662.1	662.1	662.1	662.1
December 1992	682.2	682.2	682.2	682.2	682.2	682.2	682.2
January 1993	689.9	689.9	689.9	689.9	689.9	689.9	689.9
February 1993	682.0	681.9	681.9	681.9	681.9	681.9	681.9
March 1993	662.9	662.8	662.8	662.8	662.8	662.8	662.8
April 1993	655.1	655.1	655.1	655.1	655.1	655.1	655.1
May 1993	666.0	668.0	668.0	668.0	668.0	668.0	668.0
June 1993	690.4	693.9	692.0	692.0	692.0	692.0	692.0
July 1993	718.4	720.9	717.9	721.3	721.3	721.3	721.3
August 1993	740.9	737.5	735.9	742.1	737.9	737.9	737.9
September 1993	753.0	738.7	742.7	745.8	738.5	741.3	741.3
October 1993	756.4	726.3	739.0	730.5	726.9	731.8	731.9
November 1993	..	706.5	731.6	703.6	713.4	715.9	715.8
December 1993	..	..	722.0	674.4	710.3	704.5	704.1
January 1994	..	..	..	648.6	720.7	702.3	703.7
February 1994	..	..	..	..	727.1	702.5	712.7
March 1994	..	..	..	..	..	708.4	721.3
April 1994	..	..	..	..	..	..	742.9
Change Sep-Oct 1993	0.5%	-1.7%	-0.5%	-2.1%	-1.6%	-1.3%	-1.3%
Revision in Sep estimate	-10.6%	-1.9%	0.5%	0.4%	-1.0%	0.4%	0.0%
Revision in Oct estimate	..	-4.0%	1.7%	-1.2%	-0.5%	0.7%	0.0%

.. not available
(a) Publication month refers to the month in which estimates for that period were first published.
Source: Building Approvals (cat. no. 8731.0)

The example shows how initial evidence of a turning point emerged after only a short delay (one month after publication of the first October estimate), and in the month that the October estimate was first published, the sensitivity analysis did highlight the possibility of a turning point. In subsequent months, as the trend estimates were revised, the turning point remained in evidence, and the sensitivity analysis provided useful additional information which helped indicate the reliability of the perceived turning point. Although the existence of a turning point seemed less certain on publication of the December estimates, this doubt was dispelled in later months. Thus, even with such a volatile series, the trend estimates and the accompanying sensitivity analysis enabled early detection of a turning point which was confirmed over the following months, and was validated once estimates could be produced using the Henderson moving average method. Some users prefer to base their analysis on the seasonally adjusted data, rather than the trend data (or may use different methods to smooth the seasonally adjusted series). The graph below shows the seasonally adjusted data for a slightly longer period than is covered by Graph 6 (data published between August 1993 and April 1994). Over this period there were no major revisions to the seasonally adjusted data(footnote 4).

GRAPH D. NON-RESIDENTIAL BUILDING APPROVALS

Seasonally adjusted



Source: ABS 8731.0, Monthly data

As can be seen from the graph, the seasonally adjusted series also showed the September 1993 peak discussed above. In the trend analysis, data published in subsequent months gave confirmation of the turning point. However, the seasonally adjusted data for the next few months after September 1993 gave no such confirmation. The seasonally adjusted data showed peaks in December 1993 and February 1994, and troughs in October 1993, January 1994 and March 1994, with no clear picture of the underlying movement emerging. The ABS produces trend estimates in order to give a better indication of the underlying movement in a series, which may not be evident from the seasonally adjusted data (particularly for more volatile series).

This article has explained the relevance of sensitivity analysis, which results from the method used to produce trend estimates, and has given some examples of how it can be used. For further details, readers may wish to consult A Guide to Smoothing Time Series - Estimates of “Trend” (ABS Cat. No. 1316.0) and A Guide to Interpreting Time Series - Monitoring “Trends”: An Overview (ABS Cat. No. 1348.0).

This feature article was contributed by Nicola J Chedgey while on temporary assignment to the ABS from the UK Office of National Statistics.

Footnotes

1 A point of inflexion occurs when the rate of growth/decline of a time series slows and then accelerates, continuing in the same direction. < Back

2 Henderson filters were first published in 1916 by Robert Henderson in Transactions (Actuarial Society of America) Volume 17 - “Notes on Graduation by Adjusted Average”. < Back

3 Although this is not the most recent turning point in the series, it has been chosen as it took place in a period when there were no substantial revisions to the underlying seasonally adjusted data i.e. any revisions were entirely the result of the trend estimation procedure. < Back

4 In general, major revisions to the seasonally adjusted data occur once a year, when the reanalysis of the seasonal factors takes place. In the case of Building Approvals data, this takes place in June. < Back

This page last updated 8 January 2010